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A descriptive  
analysis of the balance  
sheet and monetary policy  
of De Nederlandsche Bank:  
1900-1998 and beyond

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Christiaan Pattipeilohy

*Central bank and prudential supervisor of financial institutions*

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# Occasional Studies

Vol.II/No.3 (2013)

*Christiaan Pattipeilohy*

## **A descriptive analysis of the balance sheet and monetary policy of De Nederlandsche Bank: 1900-1998 and beyond<sup>1</sup>**

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<sup>1</sup> Comments by Peter van Els, Jurriaan Eggelte, Gabriele Galati, Martin Fase and an anonymous referee are gratefully acknowledged. The author remains responsible for any remaining errors.

# Table of contents

	<b>Abstract</b>	7
<b>1</b>	<b>Introduction</b>	9
<b>2</b>	<b>Methodological framework</b>	11
	2.1 Stylized central bank balance sheet	11
	2.2 Indicators	13
	2.3 An indicator-based typology of central banks' implementation strategies	16
<b>3</b>	<b>Descriptive analysis</b>	19
	3.1 The period 1900-1940: Gold standard	19
	3.2 The period 1940-1970: Bretton Woods	22
	3.3 The period 1970-1998: Move to European monetary cooperation	24
	3.4 The Eurosystem in the period 1999-present	27
<b>4</b>	<b>Concluding remarks</b>	31
	<b>Annex Overview of relevant balance sheet developments</b>	33
	Table A1: Relevant developments in G/L	33
	Table A2: Relevant developments in (G+L)/FX	34
	Table A3: Relevant developments in Res/Bn	35
	<b>References</b>	37

## Abstract

This paper investigates developments in the balance sheet and monetary policy of De Nederlandsche Bank in the period 1900-1998. We find that – given the institutional framework which is applicable – the composition of DNB’s balance sheet is to a large extent endogenous to monetary and financial-economic conditions. Historically, the Bank’s implementation of monetary policy was geared primarily towards the market for foreign exchange and the Dutch banking sector. However, it has not been uncommon for the Bank to also hold a portfolio of government bonds for monetary policy purposes. Our analysis suggests that monetary policy, its instruments and intermediate targets should not be viewed as fixed and unalterable concepts. Changing conditions and relations within the economy may warrant or even require innovations in the monetary policymakers’ toolbox. Clear communication is important to manage expectations on what can and cannot be expected from conventional and (previously) less conventional monetary policy measures.

## I Introduction

Since the onset of the financial crisis in the summer of 2007 central banks in developed economies have engaged in active balance sheet policies to stabilize the financial system and the global economy. This included (i) an extension of lending to the banking sector, (ii) the creation of large scale asset purchase programs and (iii) foreign exchange market interventions, with (iv) the effect on base money left unsterilized at many instances. This has led to a marked increase in the size of the central bank balance sheet relative to what could be observed before the crisis. According to Hannoun (2012) total central bank assets now exceed more than 20% of GDP for advanced economies as compared to 10% before the crisis. Moreover, active balance sheet policies led to marked changes in the composition of the balance sheets of central banks (see for an overview e.g. Borio and Disyatat, 2009; Lenza *et al.*, 2010; and Pattipeilohy *et al.*, forthcoming).

For most central banks these balance sheet policies were not part of the pre-crisis monetary policy toolkit and were in fact partly motivated by financial stability concerns. This led them to become classified as ‘unconventional’ or ‘non-standard’ policy measures as opposed to more ‘standard’ interest rate policy. However, many of these instruments are not entirely novel in the world of central banking, except perhaps for their scale and scope. The basic idea of a central bank lending to commercial banks already stems from the time of Bagehot (1873), and can hardly be called unconventional. Also, many central banks held an open market portfolio of domestic government bonds for monetary policy purposes before the crisis. Indeed, for the Federal Reserve this has been the primary asset on its balance sheet for many years (Goodfriend, 2010). And there have been many precedents of central banks intervening in markets for foreign exchange, for example when participating in a regime of fixed exchange rates. Borio and Disyatat (2009) even note that foreign exchange intervention can be interpreted as the typical unconventional policy.

This notwithstanding the crisis has reignited discussions about central bank policies and whether balance sheet instruments should be included (more explicitly) in the conventional monetary policy toolkit (Stone *et al.*, 2011). In light of this discussion it is useful to take a look at what history can tell us about the interaction between the central bank’s balance sheet and its monetary policy. In this Occasional Study we conduct a descriptive analysis of the balance sheet of De Nederlandsche Bank

(DNB) from a monetary policy perspective using historical data from 1900-1998. This allows us to study (changes in) the composition of the Bank's balance sheet under different policy regimes, i.e. either gold standard, Bretton Woods, the European Monetary System and the Economic and Monetary Union.

At this stage it should be noted that the contemporary view on what monetary policy actually comprised may have differed quite substantially under these different policy regimes. This would be reflected in changing goals, targets and instruments of monetary policy. It also means that the balance sheet composition of the central bank should be analyzed in the specific institutional context which was applicable. Still, even though important institutional changes occurred during the sample period studied, we may be able to infer some general conclusions about the underlying causes of changes in the Bank's balance sheet, which could allow us to place the current unconventional balance sheet policies in a broader perspective. Historical developments in balance sheet policies by DNB may shed some light on the extent to which these policies are actually novel (judging from a Dutch perspective). Moreover, the methodological framework presented in this paper is new and can be used to study (long-run) compositional changes in the balance sheets of central banks in general, or to investigate cross section (dis)similarities between different central banks' balance sheets.

The remainder of this study is structured as follows. In section 2 we will introduce a simple analytical framework which allows us to study and characterize central banks' operational strategies based on three quantitative balance sheet indicators. In section 3 we will employ this framework to study the developments in DNB's balance sheet in the period 1900-1998, i.e. until the euro was formally introduced. In the final paragraph of this section we will also analyze the developments in the Eurosystem's balance sheet in the period since 1999. The Eurosystem comprises the European Central Bank and the national central banks of the EU Member States which have adopted the euro, and is the system of central banks which is responsible for the conduct of monetary policy in the euro area. We will reflect on what historical developments in DNB's balance sheet can tell us about the recent unconventional balance sheet policies of the Eurosystem. Finally, section 4 concludes and provides some suggestions for future research.

## 2 Methodological framework

### 2.1 Stylized central bank balance sheet

We develop an indicator-based methodology to investigate changes in the central bank's balance sheet. The starting point for this methodology is a simplified balance sheet of the central bank as portrayed in Table 1. Typically, a central bank holds domestic debt, which may encompass either government debt (G) or private sector debt (L), and foreign exchange reserves (FX), i.e. assets either denominated in foreign currency, issued by foreign counterparties or both. The latter category also encompasses commodities which may be held for reserve purposes, e.g. gold. The central bank's primary liability is base money, which consists of banknotes (Bn) and reserves held by commercial banks in their accounts at the central bank (Res). For our purposes the latter category will also include central bank liabilities held by commercial banks with a maturity longer than current accounts, such as term deposits or debt certificates issued by the central bank, even though these are usually not formally included in the technical definition of base money.<sup>2</sup> This approach ensures that most of the central bank's liabilities are included in our analysis. Moreover, it implies that we have a full overview of the liquidity position of commercial banks vis-à-vis the central bank (i.e. resources held by commercial

**Table 1** Stylised central bank balance sheet

Assets		Liabilities	
Domestic government debt	G	Banknotes	Bn
Domestic private sector debt	L	Bank reserves	Res
Foreign exchange reserves (including gold)	FX		

<sup>2</sup> In the standard textbook approach of monetary policy the supply of base money plays an important role in determining the money creating capacity of commercial banks. However, most present day monetary authorities engage in monetary policy by setting the price of bank reserves, i.e. the interbank interest rate. This may render (parts of) the central bank balance sheet endogenous to the desired level of the interest rate. See e.g. Mishkin (2009).

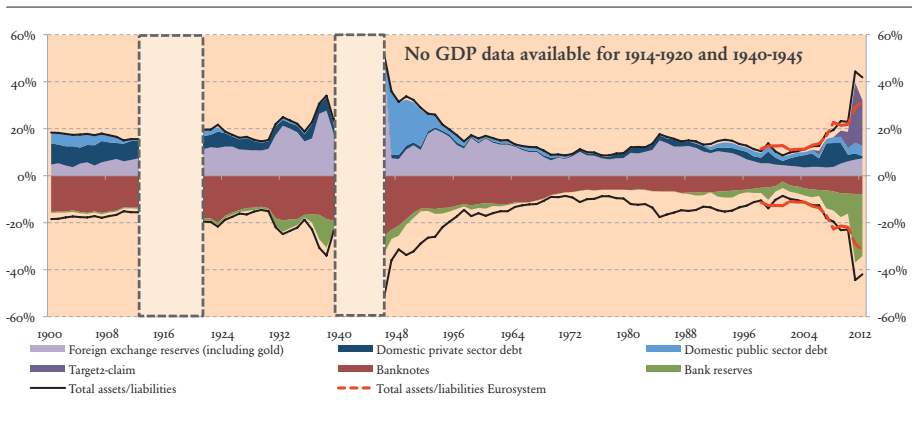


banks at the central bank which could in principle be used to settle interbank payments over a relatively short time horizon).

Figure 1 shows the historical data on the balance sheet of DNB with its components relative to nominal GDP. The graph shows that the size of DNB's balance sheet varied between 10-20 percent of GDP during the last century, except for three noticeable episodes, i.e. (i) during the Great Depression, (ii) following WWII and (iii) during the current crisis. Referring to the current situation it should be noted that part of the increase in the Bank's balance sheet is caused by the fact that DNB is an integral part of the Eurosystem, i.e. the central bank responsible for the conduct of monetary policy in the euro area since the 1999. A large part of the increase in DNB's balance sheet refers to an increase in its Target2-position, balances which net out across the Eurosystem.<sup>3</sup> Therefore it would be more appropriate to plot the consolidated Eurosystem's balance sheet relative to the euro area's nominal GDP starting from 1999. This is represented by the red-striped line in Figure 1, which still shows a marked increase in the Eurosystem's balance sheet, but less pronounced than the individual balance sheets of the participating national central banks.

In the remainder of this paper we will further investigate the observed compositional changes in the DNB balance sheet looking at both assets and liabilities. However, as an aside, readers may note that in Figure 1 on the liability side the total supply of base money (Mo), i.e. banknotes and bank reserves is strongly correlated with the total size of the DNB balance sheet. The exception being the 1950s and the 1980s

**Figure 1 Composition of balance sheet of De Nederlandsche Bank as a percentage of nominal GDP**



<sup>3</sup> See DNB (2012) for further information on the interpretation of DNB's Target2-balance.

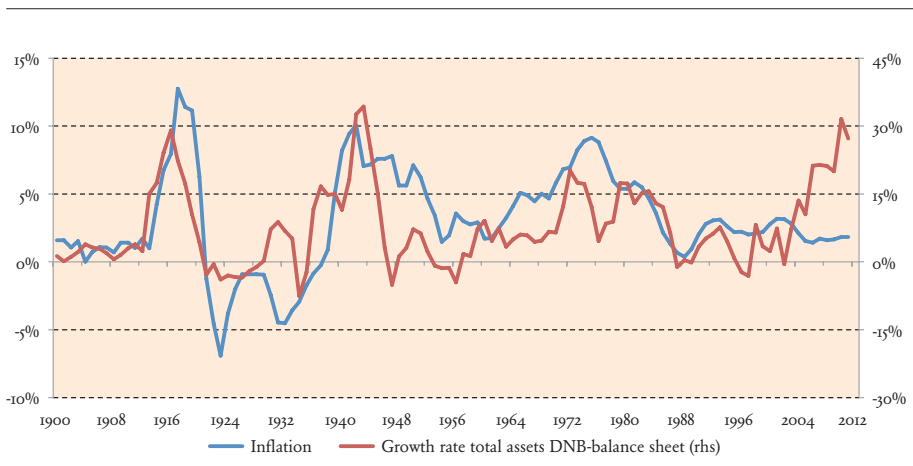
during which current account balances of the Dutch government were relatively large. If we were to assume a stable relationship between base money and broad money growth, i.e. a benchmark monetary aggregate, this may imply a quantity equation inferred relationship between DNB's total assets and inflation in the Netherlands. This historical long-run relationship has been famously documented for the US in the seminal work by Friedman and Schwartz (1963). Figure 2 shows that such a long-run relationship indeed existed, but breaks down in the recent decade. Interested readers could review Papademos and Stark (2010) on this topic, as they provide a comprehensive overview on the long-run (causal) relationship between money and inflation, which could be time variant to monetary policy regimes (Rolnick and Weber, 1997; De Grauwe and Polan, 2005), or be reduced by instability in money demand (McCallum and Nelson, 2010).

## 2.2 Indicators

Instead of zooming-in at specific time-intervals of Figure 1 for our descriptive analysis we will rely on an indicator-based methodology which allows us to map-out developments in the composition of the central bank's balance sheet in a somewhat different, more elegant graphical setting. This framework has also been utilized by Pattipeilohy *et al* (forthcoming) to study and compare developments in the balance sheets of central banks in developed economies during the recent crisis. The use of relative balance sheet indicators (i.e. balance sheet ratios) allows us to quantify and interpret relative changes in the composition of the central bank's balance

**Figure 2 Inflation and growth in DNB-balance sheet**

Five year rolling averages of annual rate of inflation and annual growth rate of total assets DNB balance sheet



sheet more thoroughly, while also taking into account interdependencies between different items on the central bank balance sheet.

We construct three balance sheet indicators. The first indicator refers to the distribution of domestic assets of the central bank and is calculated by taking the ratio of domestic public sector debt to domestic private sector debt ( $G/L$  using the definitions in Table 1). This allows us to study through which domestic channel the central bank implements its monetary policy. Second, we calculate the ratio of domestic assets to foreign exchange reserves  $[(G+L)/FX]$  which allows us to investigate to what extent the balance sheet is tuned towards external/foreign developments (relative to domestic developments). Third, we calculate the ratio between bank reserves and banknotes in circulation ( $Res/Bn$ ) which gives us an indicator for central bank liquidity supplied to commercial banks.

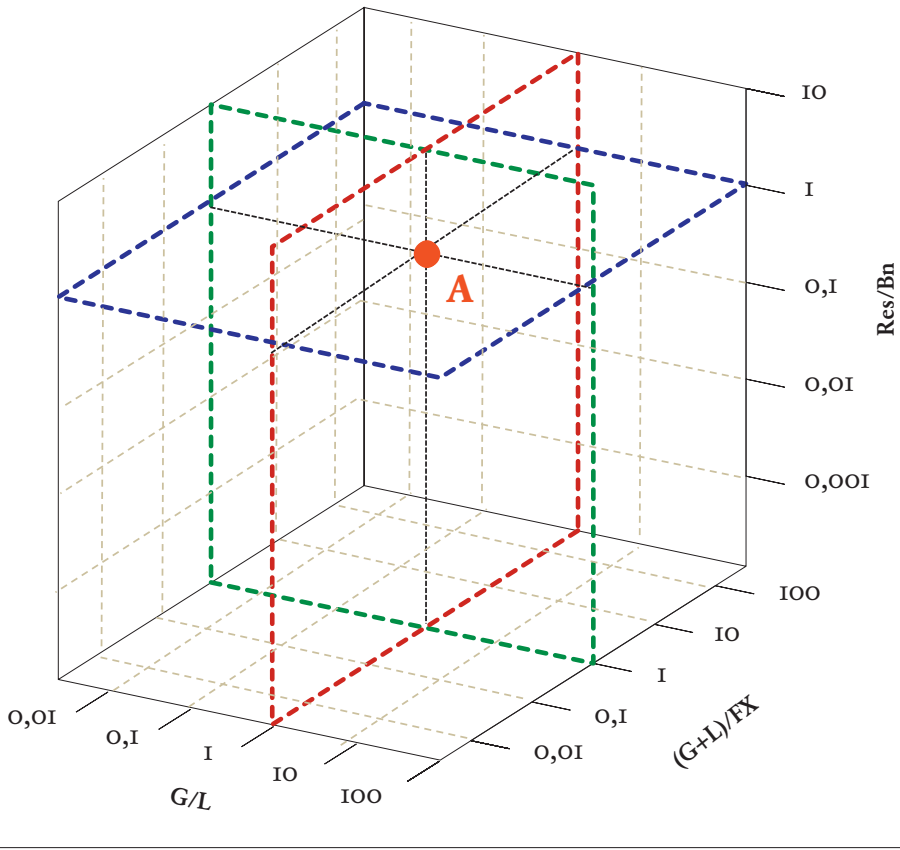
Using these three indicators any central bank can be located in the three-dimensional  $[(G+L)/FX - G/L - Res/Bn]$ -space as portrayed in Figure 3 at any point in time. The scales are denoted in logarithms to ensure that we can compare the relative distance which a central bank may cover through time. It should be noted that the central bank – not taking into account institutional, legal and behavioral constraints on which we will elaborate below – can in principle decide to position itself at any coordinate in the  $[(G+L)/FX - G/L - Res/Bn]$ -space, under the condition that the indicators take a value larger than zero (due to the logarithmic scales). That is, a central bank can decide on the size of a single indicator independent of the other two indicators. However, a single balance sheet policy measure may have consequences for all three indicators simultaneously.

This may be illustrated by an example. Consider the situation in which the central bank would want to increase its portfolio of government bonds. *Ceteris paribus* this will increase the indicator  $G/L$ , but also the indicator  $[(G+L)/FX]$ . And also the third indicator ( $Res/Bn$ ) is affected, because the central bank will have to finance the purchase of government bonds by increasing the supply of liquidity to commercial banks (if we assume the demand for banknotes to be fixed and exogenous, see also the next indent). Should the central bank consider the consequences for the latter two indicators undesirable (i.e. if it would only want to affect  $G/L$ ) it may neutralize (or sterilize) these effects by simultaneously selling domestic private sector debt (or curtailing lending to banks). This will restore the increase in  $[(G+L)/FX]$  and ( $Res/Bn$ ) and increase the original positive effect on  $G/L$ .

It should be noted that once institutional and behavioral constraints are present the central bank will no longer be completely free to position itself anywhere in the  $[(G+L)/FX - G/L - Res/Bn]$ -space. Take for instance an institutional setting in which the central bank is mandated to target a fixed exchange rate vis-à-vis another currency under the condition of free capital flows between economic regions.

**Figure 3 Three-dimensional [(G+L)/FX – G/L – Res/Bn]-space**

All axes in logarithms. Coordinate A refers to a situation with  $(G+L)/FX = G/L = Res/Bn = 1$



The impossible trinity in international macroeconomics implies that under these conditions an independent domestic monetary policy is no longer possible (Obstfeld and Taylor, 1998). Instead, domestic monetary policy may become endogenous to the monetary policy of an (implicit) anchor currency within the fixed-exchange rate regime. This has both repercussions for domestic interest rate setting and the domestic central bank's balance sheet composition, as the central bank may have to intervene by either selling or buying foreign exchange at predetermined levels of the exchange rate. Behavioral factors are relevant in particular with respect to the supply of banknotes. Typically, the central bank takes the demand of the public for banknotes as exogenous and ensures it is fully accommodated. This implies that the supply of banknotes is not a monetary policy instrument on which the central bank would decide autonomously and the Res/Bn-indicator may only be influenced directly by the central bank by changes in Res (i.e. commercial banks' reserves).

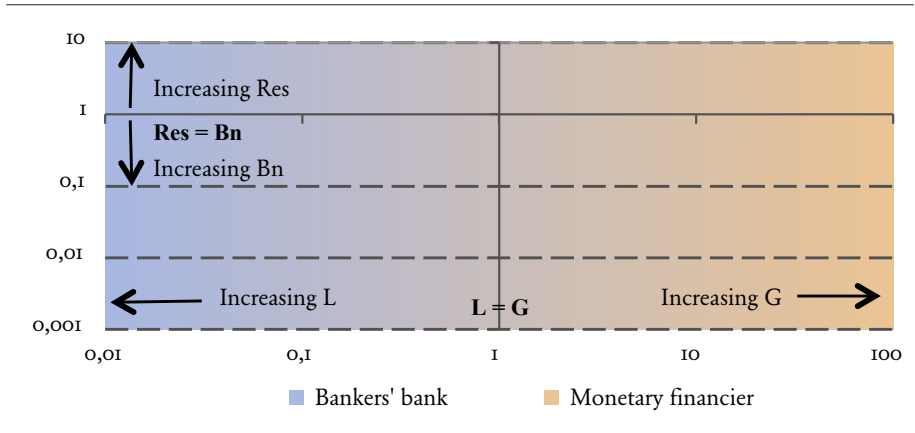
### 2.3 An indicator-based typology of central banks' implementation strategies

Studying developments in a three-dimensional graphical setting tends to become somewhat cumbersome and difficult to interpret. Therefore, for the purpose of analyzing DNB's balance sheet we will transpose Figure 3 into two graphical representations with only two dimensions each. The additional convenience is that this also allows us to typecast the central bank's strategy at a given point in time using the indicators. The common denominator in our graphical representations is the vertical axis which refers to the indicator Res/Bn in both Figures 4 and 5. This means that any change we observe in this indicator will always be represented as an upward or downward shift in Figures 4 and 5 with exactly the same distance in either diagram.

Figure 4 shows on its horizontal axis the indicator G/L, i.e. the composition of the central bank's domestic assets. A central bank operating on the left-hand side of the diagram has larger holdings of domestic private sector debt compared to domestic public sector debt. As this tends to take the form of (collateralized) lending to domestic banks, we may characterize a central bank operating in this part of the diagram as a *bankers' bank*.<sup>4</sup> A central bank operating in the right-hand side of Figure

**Figure 4 Domestic composition central bank balance sheet**

Horizontal axis refers to ratio domestic public sector debt to domestic private sector debt. Vertical axis refers to ratio reserves to banknotes.

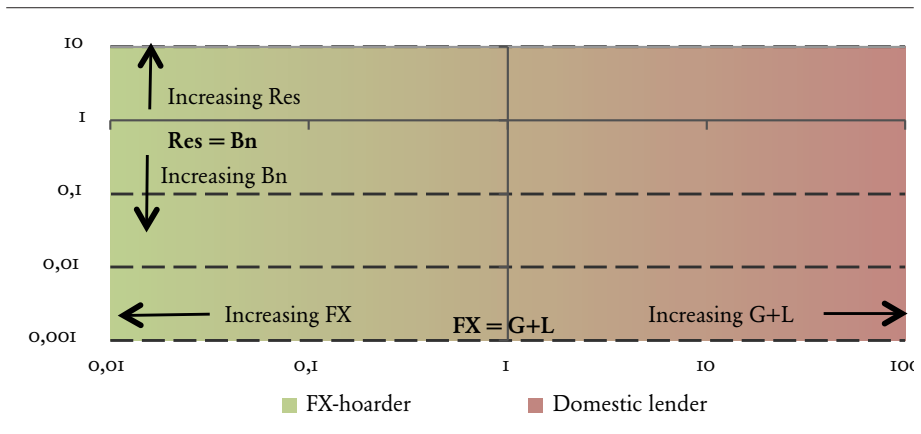


Note: Log scales. G = domestic public sector debt, L = domestic private sector debt, Res = bank reserves, Bn = banknotes.

<sup>4</sup> For DNB this assumption holds. However, central banks may also decide to lend to (or purchase assets from) the non-bank private sector. If this is the case we would ideally create a fourth indicator which measures the ratio between non-bank private sector assets and bank assets.

**Figure 5 International composition central bank balance sheet**

Horizontal axis refers to ratio domestic assets to foreign assets. Vertical axis refers to ratio reserves to banknotes.



Note: Log scales. G+L = domestic debt, FX = foreign exchange reserves (including gold), Res = bank reserves, Bn = banknotes.

4 has more domestic public sector debt on its balance sheet. Hence, we may want to classify these central banks as *monetary financiers*.<sup>5</sup>

In Figure 5 we have included on the horizontal axis the international composition of the central bank's balance sheet, i.e. the  $[(G+L)/FX]$ -indicator. In this diagram a central bank operating on the left-hand side has a larger amount of foreign exchange holdings on its balance sheet, compared to its domestic asset holdings. These central banks may be classified as *foreign exchange boarders*.<sup>6</sup> Conversely, central banks entering on the right-hand side of Figure 5 have more domestic assets relative to foreign exchange reserves which implies they may be characterized as *domestic lenders* (which may refer to either private sector, public sector or both, depending on the position in Figure 4).

The graphical representations in Figures 4 and 5 are central in our descriptive analysis of DNB's balance sheet in the following section. Therefore, a brief summing up on how to read these diagrams is warranted to assist the reader throughout the remainder of this paper. First, both Figure 4 and 5 are reduced-form portrayals of

<sup>5</sup> These definitions are our own and for illustrative purposes only. As such the definitions are in no way related to other similar concepts, e.g. the legal definition of monetary financing as in Article 123 of the Treaty on the Functioning of the European Union.

<sup>6</sup> This definition is chosen purely on the factual observation that these central banks have large foreign exchange holdings, and is unrelated to the economic motive of FX-hoarding for self-insurance purposes (see also footnote 5).

the  $[(G+L)/FX - G/L - Res/Bn]$ -space in Figure 3, both looking from a different angle. Vertical shifts in both Figure 4 and 5 reflect changes in the ratio  $Res/Bn$  and will have the same distance in either diagram. Horizontal shifts in Figure 4 will represent a change in the ratio  $G/L$ , while horizontal shifts in Figure 5 will represent a change in  $[(G+L)/FX]$ . In practice we will observe that over our sample period changes in DNB's balance sheet will affect all three indicators simultaneously, causing diagonal shifts throughout the different planes. In our descriptive analysis we will decompose these movements into a horizontal and vertical component which helps to understand the underlying dynamics. Still, our framework also allows us to interpret diagonal shifts as interdependencies between different indicators. Moreover, an additional advantage of our methodology is that the (Euclidian logarithmic) distance measured between two states can be interpreted as a quantitative indicator for the change in the composition of the central bank's balance sheet. In other words, the greater the distance between two data points in the  $[(G+L)/FX - G/L - Res/Bn]$ -space the greater the dissimilarity (or change) in the composition of the balance sheet.

## 3 Descriptive analysis

We have developed a simple framework to study developments in the composition of the central bank balance sheet. Moreover, our graphical representations allow us to relate this to monetary policy strategies, or more specifically the primary channel through which monetary policy is being implemented. In the following we will present an analysis of the balance sheet of DNB using this framework. We have calculated the three indicators for DNB's balance sheet from 1900 until 1998. We will study the developments in the different indicators from an explicit monetary policy perspective, i.e. through the eyes of contemporary monetary policy makers. The following paragraphs will each consider a separate time period, which coincide roughly (but not exactly) with different institutional regimes. All observations in the graphical representations represent a decade (which is also why the time periods do not coincide exactly with the institutional regimes), with exception of the data for the Eurosystem in Figures 12 and 13. In the final paragraph we conclude by investigating the developments in the Eurosystem balance sheet in the period 1999-2012 and try to benchmark the results against what we have observed during 1900-1998. For convenience all relevant developments per indicator are included in an annex to this paper.

### 3.1 The period 1900-1940: Gold standard

In the first period under review DNB operated under the gold standard while the Dutch financial sector started to redevelop itself. After establishing itself as a local (Amsterdam-based) commercial and note-issuing bank in the first hundred years of its existence, DNB started to develop itself into a modern central bank by the end of the 19<sup>th</sup> century (Vanthoor, 2004).<sup>7</sup> As the Dutch banking sector started to expand its activities at the onset of a new century, DNB also started to expand its domestic lending activities, most importantly lending to commercial banks, while it cut back its lending to the Dutch government (Figure 6, a shift to the left). Moreover, the Bank started to exploit its hub position in the Amsterdam-dominated Dutch banking landscape to support the development of interbank payment and

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<sup>7</sup> De Nederlandsche Bank was founded by King Willem I of the Netherlands in 1814. The King is known to refer to the Bank as 'his eldest daughter'.



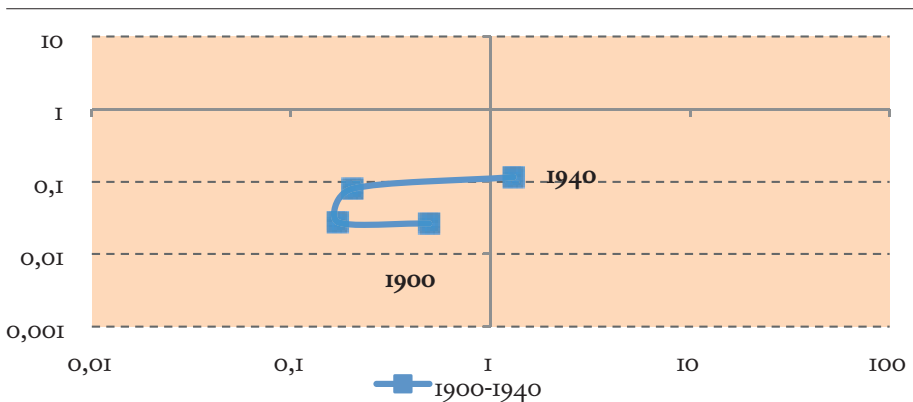
settlement infrastructures, which were virtually non-existent in the Netherlands before (De Vries, 1989). This led to an increase of reserve balances of commercial banks held in their current accounts at DNB (Figures 6 and 7, an upward shift). During this time period the Bank is explicitly taking on a role as a *bankers' bank*.

This trend is reversed starting from the 1930s. By then, lending to banks starts to fall relative to lending to other domestic residents, most specifically the Dutch government. This is reflected in a shift to the right in Figure 6. This development coincides with a larger role for the government in the macroeconomic environment following the Great Depression and – most importantly – (financial and) economic policies to prepare for the threat of war. Referring to the latter, despite resistance from DNB-president Trip, it could not be prevented that DNB engaged in monetary financing of the Dutch government in the run-up to the Second World War (De Vries, 1994). Still, the Annual Reports from these times show that lending activities from the Bank to the Dutch government were always intended to be temporary arrangements, until the threat of war dissipated (DNB, 1940). In the end these intentions could not be followed by deeds as the Netherlands became occupied by Nazi Germany which appointed a new Board to the Bank in 1941 (Vanthoor, 2004).

Turning to the international orientation of DNB during 1900-1940 we observe a noticeable shift to the left in Figure 7. This relates to the Netherlands' participation in the international gold standard and refers to multiple instances in which the Netherlands experienced strong inflows of gold, i.e. (i) during the First World War in which the Netherlands was a neutral country, (ii) after the Netherlands joined

**Figure 6 Domestic composition DNB balance sheet**

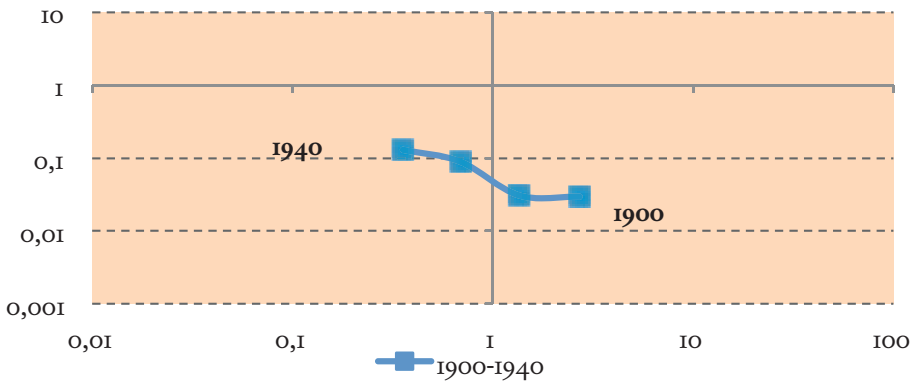
Horizontal axis refers to ratio domestic public sector debt to domestic private sector debt. Vertical axis refers to ratio reserves to banknotes.



Note: 1920 and 1930 have been included in one single observation due to overlap.

**Figure 7 International composition DNB balance sheet**

Horizontal axis refers to ratio domestic assets to foreign assets. Vertical axis refers to ratio reserves to banknotes.



Note: 1920 and 1930 have been included in one single observation due to overlap.

the gold bloc with some other European countries with the aim of maintaining the gold standard after the United Kingdom left it in 1931 and (iii) after the Netherlands finally left the gold standard in 1936 (see also Vanthoor, 2004).<sup>8</sup> The inflow of gold coincided with a strong increase in the quantity of (base) money in the Netherlands and could not rely on the approval of every economist. This is shown by a fierce public debate between professor C.A. Verrijn Stuart (1917) and DNB-president Vissering (1918). Some economists – including Verrijn Stuart – were worried about the inflationary consequences of the strong increase in the money supply. Simultaneously, they accused the Bank of neglecting its statutory responsibilities by accumulating large holdings of non-interest-bearing assets.<sup>9</sup> The Bank joined the debate by stressing that the increased money supply coincided with an increase in the demand for precautionary money balances and as such did not represent a risk to inflation. Convinced that gold would in the end regain its important role in cross-border payment and settlement arrangements, Vissering dismissed the necessity for selling gold in return for interest-bearing assets.<sup>10</sup>

<sup>8</sup> In theory an increase in the price of gold could also have led to the observed shift. However, this would also have to be reflected one-to-one in a high capital base or distribution of profits over the period under review. This is not the case, which implies the main driver for the increasing gold reserves refers to gold inflows and not price increases.

<sup>9</sup> Even though maximizing seigniorage profits has not been a statutory responsibility of the Bank.

<sup>10</sup> Ironically, the ensuing turn of events saw to it that the Bank incurred a loss of f 30 million in 1931 when the Bank of England withdrew from the gold standard. The loss was incurred on a portfolio of bills denominated in pounds sterling, which were viewed as ‘interest bearing gold’ as long as the Bank of England would guarantee its convertibility. Generally it is assumed that this financial loss was the most important reason for Vissering to resign as DNB-president in late 1931 (De Vries, 1989).

It is worth noting the analogy between this discussion on the ‘gold matter’ and the current discussion on Targetz-imbances in the euro area (see e.g. Sinn and Wollmershäuser, 2011 and Bindseil and König, 2012). The current discussion also focusses on both the financial risks of capital inflows and the potential (regional) inflationary risks. A remarkable difference is the fact that whereas Verrijn Stuart was a proponent of settling cross-border capital flows with interest-bearing assets instead of gold, some commentators currently argue for precisely the reverse.<sup>11</sup>

### 3.2 The period 1940-1970: Bretton Woods

In the second period under review significant changes in the composition of DNB’s balance sheet occurred due to policies aimed at supporting the post-war reconstruction process and obligations vis-à-vis newly established multilateral organizations in the face of the Bretton Woods international monetary system (the IMF). Allied delegates already agreed in mid-1944 to adopt a system of fixed exchange rates once the war would be ended (see Bordo and Eichengreen, 1993, for an extensive overview on the Bretton Woods arrangement). However, immediately following WWII the first priority of the Bank was not directed at maintaining a fixed exchange rate but to replenish its foreign exchange reserves. The foreign exchange reserves became depleted following the plundering of the Bank’s gold reserves by Nazi Germany (Van Renselaar, 2005) and the broader strategy of the German occupier to confiscate Dutch assets using DNB’s balance sheet, which left the Bank with a considerable claim denominated in *Reichsmarken* (De Vries, 1994). The latter claim was transferred to the Dutch Treasury in 1947 for which DNB received Dutch treasury bills in return, which means this was effectively monetary financed. In Figure 8 this transaction is represented as a shift to the right.

To be able to support the financing of the post-war reconstruction the Bank had to ensure it had sufficient foreign exchange assets at its disposal to facilitate cross-border payments. This concerned in particular US dollars, as these were one of the few currencies which were freely interchangeable (without loss of value) directly following the war (Fase, 2000)<sup>12</sup>. After a period of strict foreign exchange controls, in the end the demand for foreign currency was satisfied by a combination of selling foreign assets and external support programs, in part provided in light of the Marshall Plan. As of 1958 the Dutch current account had improved markedly and a deficit vis-à-vis the rest of the world only occurred incidentally. This meant that the problems stemming from foreign exchange shortages were gradually resolved.

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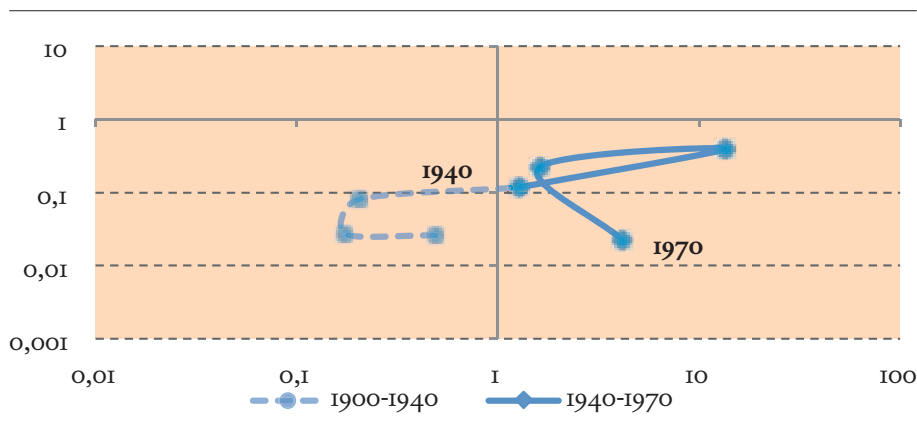
11 The specific views of Sinn and Wollmershäuser have evolved since the onset of the crisis. See Cecchetti *et al* (2012) for an overview of the debate.

12 Fase (2000) describes a situation of absolute dollar shortages in the world economy and notes this concept is ‘somewhat of a paradox for economists’ as normally prices would tend to rise to restore equilibrium.

In the 1960s the Dutch government called on DNB at multiple instances to help finance foreign commitments (Figure 8, a shift to the right). This concerned for instance early repayment of post-war support loans received from the US and Canada, but also commitments of the Dutch government vis-à-vis the IMF (DNB, 1968).<sup>13</sup> During this period the monetary policy of DNB aimed to control the supply of broad money – i.e. a benchmark monetary aggregate which was deemed relevant for inflation – by implementing quantitative restrictions on credit growth by banks. Under these circumstances monetary financing of foreign obligations of the Dutch State had no consequences on broad money growth. Indeed, quantitative restrictions on lending implied that money market conditions were non-relevant for the capacity of the banking sector to increase the money supply (Fase, 2000). This allowed DNB to gradually decrease the ratio of required reserves to 0%, to compensate the banking sector for other measures which had a tightening impact on bank lending. This implied that banks only had to hold a relatively small amount of liquidity in their accounts at the central bank to accommodate day-to-day liquidity fluctuations due to payments transactions. The preferred level of reserves turned out to be much lower than what was required under the required reserves arrangement (Figures 8 and 9, a downward shift).

**Figure 8 Domestic composition DNB balance sheet**

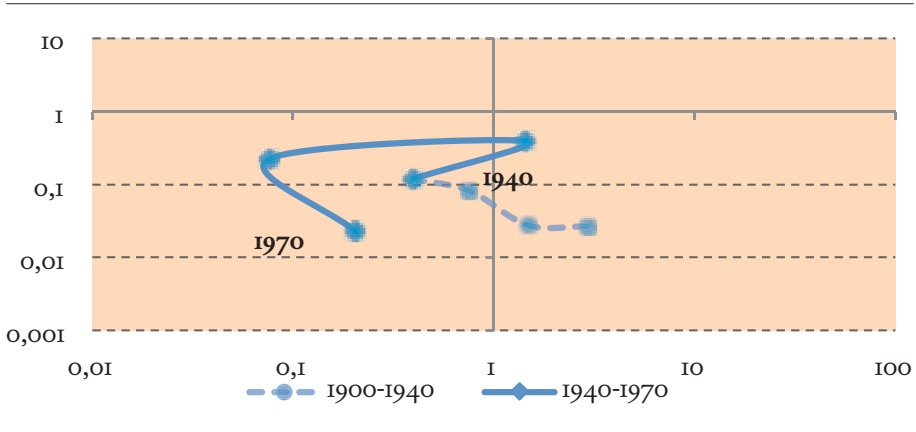
Horizontal axis refers to ratio domestic public sector debt to domestic private sector debt. Vertical axis refers to ratio reserves to banknotes.



<sup>13</sup> Currently liabilities of the Dutch State vis-à-vis the IMF are still financed by DNB, with an explicit guarantee from the Dutch Treasury on the assumed credit risk.

**Figure 9 International composition DNB balance sheet**

Horizontal axis refers to ratio domestic assets to foreign assets. Vertical axis refers to ratio reserves to banknotes.



### 3.3 The period 1970-1998: Move to European monetary cooperation

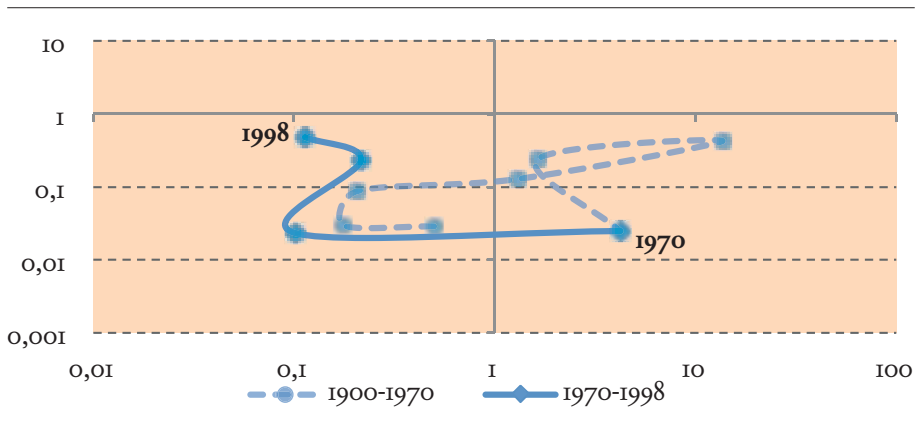
The beginning of the 1970s was marked by turmoil in international markets for foreign exchange, which culminated in the fall of the Bretton Woods monetary arrangement, when the US unilaterally terminated the convertibility of the US dollar to gold. The impact of these developments on the composition of DNB's balance sheet was quite significant (even though Figure 1 did not show a material change in the size of the balance sheet of DNB during this episode). This refers in particular to the composition of domestic assets held by the Bank (Figure 10, a marked shift to the left). The observed shifts can be explained by several policy measures which were taken by DNB to support the exchange rate of the US dollar which was being offloaded by financial market participants. First, the Bank engaged in selling its open market portfolios of Dutch treasuries. Second, it stepped up lending to commercial banks. Third, as the pressure on the US dollar intensified, restrictions to foreign currency transactions were implemented, which explains why the distribution between foreign and domestic assets held by the Bank remained relatively stable (Figure 11, no horizontal movement). These developments marked the beginning of the end of the Bretton Woods arrangement, which – after rebounding briefly with the Smithsonian Agreement in 1971 – was finally terminated in early 1973.

Meanwhile, following the events of 1971, the six member states of the European Community (EC)<sup>14</sup> had already concluded that a return to a regime of fixed

<sup>14</sup> At that time this included the Netherlands, Belgium, Luxembourg, Germany, France and Italy.

**Figure 10 Domestic composition DNB balance sheet**

Horizontal axis refers to ratio domestic public sector debt to domestic private sector debt. Vertical axis refers to ratio reserves to banknotes.



exchange rates between EC currencies was desirable (Vanthoor, 1996). In 1972 this led to the formalization of the ‘Snake-arrangement’.<sup>15</sup> While not all members were able to maintain a fixed exchange rate within the Snake at all times (see Vanthoor, 1999, for an extensive overview), the Dutch participation within this arrangement was quite successful. In 1979 the Snake was transposed to the European Monetary System (EMS).

Increased European policy cooperation and coordination combined with the liberalization of international capital markets implied that domestic monetary developments lost relevance for Dutch monetary policy. Instead, the exchange rate gradually became the dominant (intermediary) monetary policy target for the Bank. This led the Bank to gradually reorient its strategy and instruments to be able to maintain a fixed exchange rate. The final measures which were explicitly directed at the domestic money supply were the temporary creation of a new open market portfolio of Dutch treasury bonds (Figure 10, a temporary shift to the right) and a ‘monetary cash reserve’ which was instituted by the end of the 1980s (DNB 1988, 1989). De Greef *et al* (1998) explain that the open market portfolio was primarily meant to have a signaling function to communicate to financial markets the central bank’s view on the stance of monetary policy and the shape of the yield curve (see

<sup>15</sup> Until 1973 the ‘Snake’ functioned within the context of the Smithsonian Agreement leading commentators to refer to the arrangement as ‘the Snake in a tunnel’. After the Smithsonian Agreement could no longer be maintained the Snake was able to move freely versus other currencies, i.e. it was no longer confined within the bounds of the tunnel. The Benelux countries decided to restrict the bandwidths for their currencies beyond which was specified by the Snake, which was characterized as a ‘worm crawling within the Snake’ (Vanthoor, 1996 and 1999).

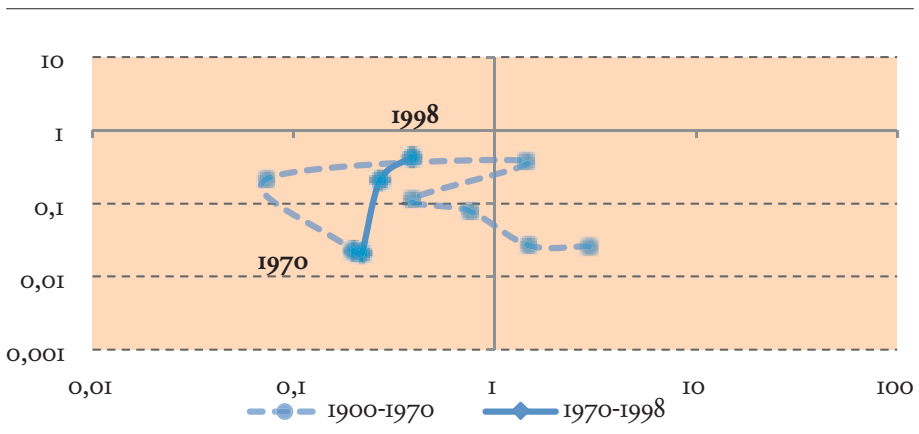
also Hilbers and Hoogduin, 1996). Relative to the total market for Dutch treasuries the portfolio and the transactions conducted by DNB were very limited in size. The monetary cash reserve arrangement was unique in the sense that it did not actually require commercial banks to hold reserves in their accounts at DNB (DNB, 1989; Hilbers, 1989). Rather, it required banks to pay a penalty on credit expansion beyond an ex ante specified threshold (mimicking the costs banks would incur if they actually were required to hold non-interest bearing reserves at DNB). The introduction of the open market portfolio and the monetary cash reserve were intended to provide the Bank with more market-based instruments, compared to the former instrument of (gross or net) restrictions on credit growth.

As noted, however, policies aimed at maintaining a fixed exchange gradually gained in importance in DNB’s monetary policy framework. To this end, in 1988 a money market cash reserve requirement was introduced. The money market cash reserve was very different from the monetary cash reserve as it indeed aimed at absorbing excess liquidity in the banking sector (De Greef *et al*, 1998). The use of this new instrument increased noticeably after it was first introduced, which is reflected in a strong upward shift in Figures 10 and 11. Part of this increase in excess reserves was absorbed by the issuance of DNB debt certificates starting from 1994. As noted in section 2 these are included in our Res/Bn indicator displayed on the vertical axis, even though these are typically not included in the formal definition for base money.

As we are nearing the end of the 1990s we are also nearing the conclusion of the history of the Bank as an independent monetary authority responsible for safeguarding the value of the Dutch guilder. As of 1 January 1999 the third stage

**Figure 11 International composition DNB balance sheet**

Horizontal axis refers to ratio domestic assets to foreign assets. Vertical axis refers to ratio reserves to banknotes.



of EMU starts and eleven European currencies – including the Dutch guilder – are irrevocably locked together by fixed exchange rates and replaced by the euro (Vanthoor, 1999). At this stage DNB enters the Eurosystem, which consists of the European Central Bank (ECB) and the national central banks and henceforth will be responsible for monetary policy in the newly established currency union.

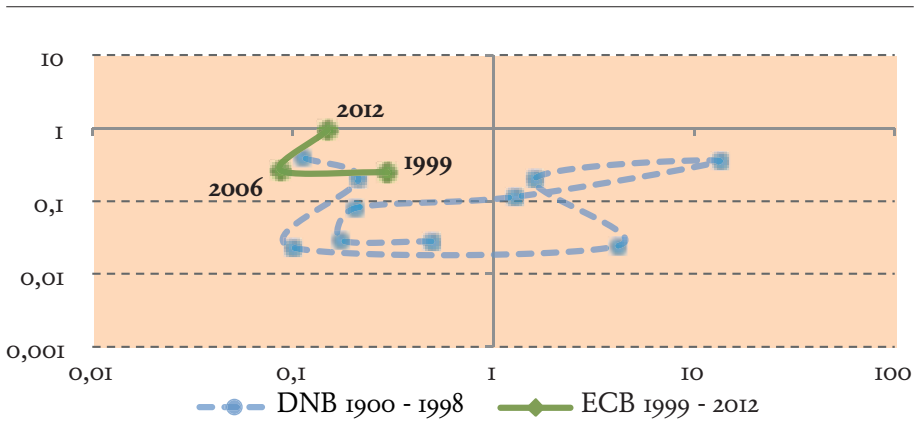
The second half of the 1990s is characterized by preparations for this specific development. It sees DNB streamlining its money market cash reserve requirement system and lending operations to banks, in line with the proposed Eurosystem monetary policy framework. De Greef *et al* (1998) note that the Netherlands’ very successful participation in earlier European monetary arrangements implied that DNB’s policy framework was already very much tuned to the European context. Due to the credibility DNB gained in the context of earlier European exchange rate mechanisms, active balance sheet policies to defend the exchange rate became less of a necessity in the run-up to EMU, which is reflected in relatively stable balance sheet ratios (and which actually allowed DNB to sell some of its gold reserve; Figure 11, slight shift to the right).

### 3.4 The Eurosystem in the period 1999-present

To conclude our descriptive analysis we will briefly discuss some relevant changes in the Eurosystem’s balance sheet since the establishment of the euro. Similar to what we have observed for DNB during the 20<sup>th</sup> century, Figures 12 and 13 show that the balance sheet of the Eurosystem has also seen compositional changes during the first decade of EMU. Between 1999 and 2006 (i.e. the pre-crisis period)

**Figure 12 Domestic composition DNB balance sheet**

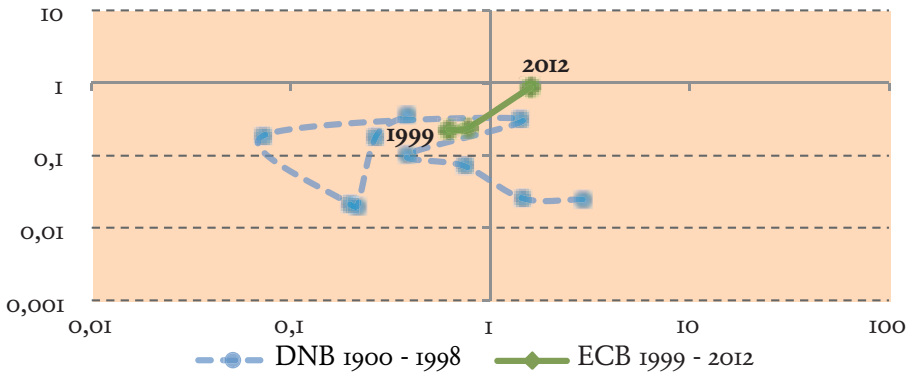
Horizontal axis refers to ratio domestic public sector debt to domestic private sector debt. Vertical axis refers to ratio reserves to banknotes.





**Figure 13 International composition DNB balance sheet**

Horizontal axis refers to ratio domestic assets to foreign assets. Vertical axis refers to ratio reserves to banknotes.



the Eurosystem saw its lending operations to banks increase (Figure 12, a shift to the left). Banks' demand for central bank liquidity increased steadfast due to the issuance of banknotes and growth of the euro area banking sector which implied higher demand for reserve balances in absolute terms even though the relative reserve holdings ratio remained unchanged (no vertical movement in Figures 12 and 13). In Figures 12 and 13 it is visible that the composition of the Eurosystem's balance sheet in 1999-2006 is very reminiscent to DNB's balance sheet composition during 1990-1998 (as the Eurosystem moves closely within the range of DNB in this period).

A clear shift can be observed during the crisis. First, liquidity supplied to the banking sector has increased beyond what is necessary to satisfy the reserve requirements which are imposed by the Eurosystem (Figure 12 and 13, an upward shift between 2006 and 2012). Moreover, even though many crisis measures of the Eurosystem were geared towards the banking sector, a purchasing program for sovereign debt instruments was also established in May 2010 (the Securities Markets Program, or SMP). This development is reflected by a shift to the right in Figure 12. And indeed, the ECB has decided on a new program for government bond purchases with policy conditionality in mid-2012 (Outright Monetary Transactions, or OMTs). While no purchases have been made under this arrangement thus far any such steps will imply a further shift to the right in Figure 12 (*ceteris paribus*).

If we measure changes in the balance sheet composition by taking the distance between two data points in Figures 12 and 13, it is noticeable that the recent changes in the Eurosystem's balance sheet are not exceptionally large when we compare it

with DNB during any earlier episode. This holds both when we look at the distance between 2006-2012 and 1999-2012. As such, we may conclude that - while current circumstances and policy measures are certainly exceptional - there have been precedents in recent history which saw the Bank being forced out of its comfort-zone, i.e. its former balance sheet configuration, even further.

## 4 Concluding remarks

In the previous section we have put forward an elaborate descriptive study of historical developments in DNB's balance sheet. Indeed, by studying the developments over a timespan which almost encompasses a century the aim of this study has been very ambitious from the start. This means that our analysis will not be exhaustive from a macroeconomic/monetary policy perspective nor (and in particular) from a historical perspective.<sup>16</sup> Furthermore, it should be noted that our analysis has been purely descriptive and not explanatory. Moreover, we have refrained from any discussion on interest rate policy by DNB, traditionally the most important monetary policy instrument. A more comprehensive quantitative empirical analysis into the determinants of DNB's balance sheet remains an interesting topic for future research. Thereby, it should be taken into account that the balance sheet of the central bank is not a phenomenon which stands on its own. Indeed, many of the developments in the central bank's balance sheet will be endogenous to contrary balance sheet changes in other economic sectors. Brainard and Tobin (1968) already stressed the importance of incorporating the interdependencies between markets in theoretical and empirical models (e.g. by including balance sheet identities as binding constraints). In fact, this formed the backbone of the first econometric quarterly monetary model for the Netherlands which was constructed by the Bank in the 1980s (Fase, 1981). And indeed Tobin's portfolio rebalancing channel has also drawn renewed attention in the present day discussion on the effects of non-standard monetary policy as opposed to the New-Keynesian conviction that these effects are irrelevant (see e.g. Vayanos and Vila, 2009; d'Amico and King, 2012; and Zampolli, 2012).<sup>17</sup> The current situation provides an excellent opportunity to revisit this debate and investigate the relevance of portfolio rebalancing effects, not only looking at recent developments but also testing hypotheses to historical data.

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<sup>16</sup> There exists an extensive literature on the history of the Bank by different authors, see e.g. Vanthoor (2004) and reference therein.

<sup>17</sup> In a standard New Keynesian framework as originally proposed by Eggertsson and Woodford (2003) managing expectations about the future path inflation (and a policy rate consistent with this path) is the main channel through which monetary policymakers can influence the economy. The composition of the central bank's balance sheet is irrelevant, except for the signalling effects it may have on future inflation (and policy rates). Cúrdia and Woodford (2011) acknowledge that the portfolio rebalancing channel may be relevant in a New Keynesian setting with imperfect asset substitutability (even though this may only be the case when markets are severely disrupted).

Notwithstanding the abovementioned caveats and suggestions for future research, some general conclusions can be drawn from our descriptive analysis. First, it shows that the balance sheet of a central bank can provide a very telling story about economic developments. Moreover, our analysis shows that the way a central bank conducts its monetary policy is to a large extent endogenous to the monetary- and financial economic conditions which are applicable, within the institutional responsibilities which have been conferred on the central bank (which may imply a changing intermediate target variable over time). Moreover, our analysis suggests that monetary policy and its instruments should not be seen as fixed and unalterable concepts. When structural changes occur in economic and financial relations this may very well warrant - or even necessitate - changes in the conduct of monetary policy. These changes may occur gradually over time or more abrupt during a financial crisis.

Still, monetary policy cannot solve every economic problem, despite the considerable leeway it has to engage in less conventional policies by stretching up its balance sheet. For instance, central bank actions cannot substitute for structural reforms to enhance potential economic growth. As noted by Caruana (2012), active central bank interventions may create unrealistic expectations about the potency of monetary policy. Therefore, careful communication on the goals and targets of monetary policy measures is of clear importance to manage expectations on what may be expected from monetary policy. This holds in particular when the monetary authority engages in unconventional policy measures which had not been part of the monetary policy maker's toolkit before.

## Annex Overview of relevant balance sheet developments

**Table A1: Relevant developments in G/L**

<i>Time period</i>	<i>Relevant developments</i>	<i>Effect on G/L</i>
1900-1910	Increase in lending to banking sector, while decreasing lending to Dutch government	Decrease
1910-1920	No noticeable developments	Stable
1920-1930	No noticeable developments	Stable
1930-1940	Monetary financing of government debt in the run-up to WWII	Increase
1940-1950	Swap of Reichsmarken reserves with Dutch T-bills	Increase
1950-1960	Redemption of T-bills portfolio by Dutch government	Decrease
1960-1970	Monetary financing of post-war debt repayments and liabilities versus multilateral institutions	Increase
1970-1980	Sell-off of open-market portfolio and increased guilder lending to commercial banks in the face of Bretton Woods currency crisis	Decrease
1980-1990	Purchase of new open-market portfolio for exchange rate management	Increase
1990-1998	Gradual sell-off of open-market portfolio	Decrease
<b>Eurosystem:</b>		
1999-2006	Increased lending to banks to accommodate higher level of required reserves	Decrease
2006-2012	Purchases of government bonds in the context of Securities Markets Programme (SMP)	Increase

**Table A2: Relevant developments in (G+L)/FX**

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<i>Time period</i>	<i>Relevant developments</i>	<i>Effect on (G+L)/FX</i>
1900-1910	Steady inflow of gold	Decrease
1910-1920	Increased inflow of gold (due to neutral status in WWI)	Decrease
1920-1930	No noticeable change	Stable
1930-1940	Steady inflow of gold (due to the Netherlands strong resolve to maintain the gold standard, and relatively small outflows once the gold standard was dropped)	Decrease
1940-1950	Nazi Germany confiscatory policies depleted foreign exchange reserves	Increase
1950-1960	Policies to increase foreign exchange reserves (strict capital controls, Marshall support and sell-off of foreign assets)	Decrease
1960-1970	No noticeable change	Stable
1970-1980	No noticeable change (partly due to capital controls during Bretton Woods crisis)	Stable
1980-1990	No noticeable change	Stable
1990-1998	Some selling of gold reserves possible due to successful participation in EMS	Increase
<b>Eurosystem:</b>		
1999-2006	No noticeable change	Stable
2006-2012	Increased domestic lending due to financial crisis	Increase

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**Table A3: Relevant developments in Res/Bn**

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<i>Time period</i>	<i>Relevant developments</i>	<i>Effect on Res/Bn</i>
1900-1910	No noticeable developments	Stable
1910-1920	Increased intermediation in interbank payments and settlements	Increase
1920-1930	No noticeable developments	Stable
1930-1940	No noticeable developments	Stable
1940-1950	Purge of post-war overhang of currency in circulation	Increase
1950-1960	No noticeable developments	Stable
1960-1970	Cancellation of reserve requirement arrangement	Decrease
1970-1980	No noticeable developments	Stable
1980-1990	Reintroduction of reserve requirements arrangement	Increase
1990-1998	Streamlining of reserve requirements arrangement in line with proposed Eurosystem framework	Increase
<b>Eurosystem:</b>		
1999-2006	No noticeable change	Stable
2006-2012	Increased excess/precautionary reserves in banking sector to mitigate liquidity risks during financial crisis	Increase

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